

Ceramic Coatings

The Ceramic Coatings Program addresses plasma spray deposited and physical vapor deposited ceramic thermal barrier coatings (TBS) used in aircraft, land-based turbines, and diesel engines as well as wear resistant coatings used in many applications. These materials are a significant portion of the nearly one billion dollar North American ceramic coatings market. A primary goal of this program is improve the reliability of ceramic coatings. Collaborations have been established, e.g. Pratt and Whitney, General Electric, Caterpillar, METCO, Praxair Coating Technologies, as well as the Thermal Spray Laboratory at the State University of New York at Stony Brook, NASA Lewis Research Center and the Thermal Spray Laboratory at Sandia National Laboratory to enable research on relevant materials and to transfer results to users. Collaborations are also underway with Bundesanstalt für Materialforschung und -prüfung (BAM) and Deutsche Forschungsanstalt für Luft-und Raumfahrt (DLR), both in Germany, for the development of characterization techniques for thin, hard coatings and TBCs. A strong attribute of the coatings research program is the use of common materials for which complementary data can provide a more complete understanding of processing-microstructure-property relationships.

Participants in the NIST program are located in MSEL, i.e., Ceramics Division, Materials Reliability Division, Metallurgy Division, and the NIST Center for Neutron Research, as well as in the Chemical Science and Technology Laboratory.

The program has the following elements:

- Development of predictive models for the long-term reliability of ceramic coatings under operating conditions.
- Relating microstructural characteristics such as fine voids and phase stability to thermal and mechanical properties.
- Developing and validating microstructure based models that predict coating performance.
- Development of measurement methods, such as online instrumentation for improved control of thermal spray processes and thermal properties.